represent an oviposition error. The observation is particularly surprising owing to the fact that the grass was isolated in weedy picnic area several meters away from the nearest known viable host. Additionally, the female spent considerable time (~10 seconds) walking over the vegetation before depositing an egg.

The incidence of the unusual ovipositional behavior observed by *L. cassius theonus* may be explained by the fact that it utilizes over 15 different plant species in some 12 genera as larval hosts. Compared to more specialized species, which have been shown to make more rapid and/or accurate decisions regarding potential host acceptability, polyphagous species must properly recognize as well as rank a variety of available plant possibilities. As a result, individual decisions on whether to accept a plant as a viable host may take longer and/or lead to less accurate results (Bernays, 1988; Janz and Nylin, 1997; Nylin, 1988; Nylin et al., 2000).

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USE OF AN EXOTIC WEED AS AN OVIPOSITION SUBSTRATE OF THE HIGH-ANDEAN PIERID *PHULIA NYMPHULA*

Additional key words: Hirschfeldia, Brassicaceae, Argentina

The phenomenon of butterfly adaptation to exotic hosts is probably global. Shapiro (2002) and Graves and Shapiro (2003) documented the extensive use of exotic plants as oviposition substrates and larval hosts by native Californian butterflies. Most of the plants and thus most of the records are concentrated at low elevations. Shapiro (1991) gave numerous records of adaptation to exotic hosts for Pieridae in Argentina and suggested that use of weedy hosts may have facilitated the formation of hybrid zones in the genus *Tatochila* Butler. In a later paper (Shapiro 1997) he showed that such plants are being used by a significant proportion of the world's southernmost butterfly fauna, in extreme southern Patagonia and Tierra del Fuego. This paper reports the first case of this sort for the high-Andean fauna.

Phulia nymphula Blanchard (*sensu lato*; more than one genetic species is suspected to be involved) is the most widely-distributed of a lineage of mostly very small Pieridae endemic to the high Andes, the world's high-altitude Pierid record at about 5500m. *Phulia* and its close relatives are very small and display a variety of morphological and behavioral specializations, at least some of which reflect the pervasive importance of thermoregulation in their extreme environment. All the species of this lineage reared to date feed on Brassicaceae, such as the boreal genus *Draba*.

I first reported (Shapiro 1991) a new southern limit for *P. nymphula* in the Andes, in the vicinity of the Las Lenas ski resort in southwestern Mendoza province, Argentina, based on collections and observations made in the austral spring of 1989. At that time the butterfly was seen only at or above 3000m. No host plant was identified. I revisited the area in the austral summer of 2004. During the intervening 15 years the Mediterranean Brassicaceous weed *Hirschfeldia incana* (L.)Lagr.-Fossat (usually referred to in the literature as *Brassica geniculata* (Desf.)Ball) became established around the ski village complex at about 2250m. On 2 February 2004 *P. nymphula* was abundant throughout the complex. Adults visited flowers of *H. incana* and eggs were being laid on small rosettes (diameter under 6 cm). No other Brassicaceous plants were observed in the area. I did not look for larvae, being pressed for time. Strikingly, females showed no interest in ovipositing on the large plants. Numerous courtships and pairs in copula were noted.

Hirschfeldia is not a very common weed in western Argentina. In California it is a very frequent host of

weedy Pieridae including *Pieris rapae* L. and *Pontia protodice* Bdv. & LeC., but it is almost never seen above 1500m and is completely absent in climates comparable to that at Las Lenas. The erect, even bushy growth form of this plant has no analogue in the native brassicaceous flora of the high Andes. It would seem *P. nymphula* has successfully colonized this plant by focusing strictly on small rosettes, whose growth form, with tightly imbricated leaves, is familiar to it as the mature plant is not.

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SURVIVAL OF FREEZING AND SUBSEQUENT SUMMER ECLOSION BY THREE MIGRATORY MOTHS: *MANDUCA SEXTA* AND *HYLES LINEATA* (SPHINGIDAE), AND *HELICOVERPA ZEA* (NOCTUIDAE).

Additional key words: overwintering, *Heliothis virescens*

Hyles lineata (Fabricius) and *Helicoverpa zea* (Boddie) are well known migrants whose overwintering limits are apparently poorly known. Winter pupal diapause has been previously discussed (e.g. Johnson, 1995) for *H. zea* in Arkansas, and for other *Helicoverpa* species on other continents (e.g. Gregg *et al.*, 1995). However, while Ferguson (1991) listed *Manduca sexta* (Linnaeus) as a migrant, McNeil *et al.* (1995) repeatedly referred to it as non-migratory. All three species range into the Neotropics. Most southern migrants listed by Ferguson peak in September, October or November in southern New Jersey, but *M. sexta* does not. The latest specimen date found for *M. sexta* for New Jersey, Pennsylvania, or Delaware (collections of Rutgers University, University of Delaware, W.J. Cromartie, the late Joseph Muller, myself) is 12 September and 87% of 30 available specimen and observation dates are from 6 July to 4 September, which includes a partial second brood (my rearings in Connecticut and New Jersey). Jones (1928–1929) reports mid July through August for Delaware, and Smith (1910) and Tietz (1952) report none after September for New Jersey and Pennsylvania. Pupal diapause increases from about 5% in June to 95% in mid August even in northern Florida (Villanueva, 2005). Furthermore, although the related migrants *Agrius cingulatus* (Fabricius) and *M. quinquemaculata* (Haworth) have both been collected several times far to the north in Maine (Brower, 1974), Vermont (Grehan *et al.*, 1995), Nova Scotia (Ferguson, 1955), and Quebec (Handfield, 1999) often in September and October, the generally more common *M. sexta* is unreported by any of those sources. All of these factors suggest northeastern populations of *M. sexta* are not strongly migratory, but occurrence on Bermuda and in the Galapagos Islands (Ferguson, 1991) seems to affirm migratory status elsewhere.

In late November 2001 I unexpectedly found a still living pupae of *Helicoverpa zea* from a caterpillar reared from local (Cumberland County) corn in late summer in a small plastic container with a few cm of peat. I placed it indoors for two weeks and when it did not develop, I moistened the peat, put it in my refrigerator, and returned it to ambient conditions on 15 March. In late November 2002, four small peat-filled containers each containing an *H. zea* pupa from larvae on local corn or bell pepper were packed among dead leaves inside a large Styrofoam box with numerous other pupal containers. I placed the box in a coal bin off my house, which is mostly enclosed, but outside, unheated, and with a floor of natural ground. Three other *H. zea* that had entered the soil as prepupae 30 August to 9 September 2002 eclosed later that month, providing strong evidence that these four, which were also prepupal on or before 10 September, were in diapause. All larvae were reared outdoors.

In October 2002 Robert Barber gave me three small